ERGONOMICS DEMONSTRATION PROJECT

Controlling Musculoskeletal Hazards in the Fasteners Industry

Lessons from Empire Bolt & Screw

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Department of LABOR AND INDUSTRIES

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-Lessons from Empire Bolt & Screw Demonstration Project

Department of Labor and Industries
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Introduction

The major operations of most American fasteners distribution companies require importing fasteners from other countries, re-packing them and selling and distributing them in the domestic market. The demonstration project employer, Empire Bolt & Screw located in Spokane, Washington, is one typical company of this type.

The goals of this demonstration project were to:

- Identify caution zone and hazard zone jobs as defined in the Washington State Ergonomics Rule (WAC 296-62-051)
- Identify engineering and administrative controls to eliminate hazards
- Identify additional controls that could be used to improve comfort and productivity even though the Washington State Ergonomics does not require this.

Major activities at Empire Bolt and Screw include:

- Warehouse functions
- Packaging tasks
- Customer service duties and
- Office work

Many of the risk factors listed in Washington State's Ergonomics Rule are present in the different activities of this industry. For instance, handling heavy boxes in warehouse activities, repetitive movements and high hand force in the packaging tasks, and awkward postures in customer service and office activities.

With the emphasis on safe work practices from management and active involvement of employees of Empire Bolt and Screw, this company was able to reduce the hazards related to exposure to these risk factors. Following are examples of what this company has done.

Improving heavy lifting tasks

Risk factors: Lifting heavy boxes containing metal parts is a common activity in this industry. Most boxes weigh about 25 to 64 lb. Boxes could be picked up from floor level or at skids and placed on shelves at varied heights. Another heavy lifting activity could be found in the dispatching area, where heavy metal rods are delivered to customers. Handing these long, heavy rods could present a hazard if this is done manually.

Based on Washington State's Ergonomics Rule, this job could be a caution zone job because of:

- lifting objects weighing more than 75 pounds once per day or more than 55 pounds more than 10 times per day,
- lifting objects weighing more than 10 pounds if done more than twice per minute more than 2 hours total per day,
- lifting objects weighing more than 25 pounds above the shoulders, below the knees or at arms length more than 25 times per day.

This job might also be a hazard zone job if done improperly. For example, if the job is designed so that the worker has to lift the object from the floor and only one worker is assigned to the lifting task, the number of repetitions is increased for that worker during a workday, it could easily present a hazard.

Solutions: At Empire Bolt and Screw, efforts have been made to reduce the hazard due to the heavy lifting risk factors through: (1) worker awareness education, (2) use of mechanical assists, (3) share lifting tasks through work organization, and (4) good work practices.

(1) Workers awareness training: The company gives new employees orientation training to their job functions. Workers are informed of potential risk factors such as heavy lifting at the job, and possible solutions. Recently, the company used a PowerPoint presentation material (Ergonomics Assessment – Examples of Risk Identification and Solutions), which was developed by the SHARP program of Washington State Department of Labor and Industries for the fastener industry in their new employees' orientation training.

(2) Use of mechanical assists: A forklift was used to lift very heavy boxes, or heavy metal materials. For example, larger and heavy boxes are placed at bottom level of the shelves. Forklift trucks are used to transport heavy and large boxes into or from their locations (see Figure 1).

Figure 1. Using a forklift to handle large, heavy objects

Previously the company had the heavy metal rods stored vertically (see Figure 2). When dispatching these metal materials to their customers, manual lifting was required. An improvement that the company implemented was to store the metal rods on racks horizontally (see Figure 3), so that the forklift can be used to lift the metal materials to dispatch them to the customers.

Figure 2. Vertical stacking requires manual handling

Figure 3. Horizontal stacking with forklift

(3) Share lifting tasks through work organization: Workers are sharing different task activities (such as receiving, dispatching, preparing orders etc.) within the company, rather than being assigned only to do the heavy lifting part. With this work organization arrangement, although lifting is more than 10 times per day, the tasks usually do not occur more than 2 hours per day and often involve less than 1 lift per minute.

(4) Good work practices: Recognizing that the improper work height of the lifting tasks could increase the level of risk, workers at the company developed good practices to reduce the hazard. They use forklift trucks to raise heavy boxes to waist height (see Figures 4-5). From there they can lift boxes with much less physical effort.

Figure 4. Forklift raises heavy boxes

Figure 5. Heavy boxes between knuckle-shoulder

With all the improvements, although the job might still be in the caution zone, it is not a hazard zone job. From conversations with the workers, we also learned that there is a trend in the fastener distribution industry for reducing the weight of fastener boxes sent by manufacturers. This reduces the hazard of heavy lifting as well.

Solving repetitive and high hand force problems

Risk factors: In the packaging area, the worker takes components out from big boxes and packs them into smaller boxes or bags for distribution. Lifting boxes while holding the flaps of the boxes requires using hand pinch grips. In packaging, a scoop is used to take fasteners from a bin to place in smaller boxes for distribution to customers. High hand force is likely involved when grasping the scoop and repetitive movements also occur during the operation (see Figure 6). High hand force

Figure 6. High hand force using hand scoop

is also likely involved when the worker transports packed boxes into a plastic container when the hands are in pinch grip postures (see Figure 7.). The worker does not spent his whole workday on the packaging task, but usually shares activities with other workers and performs order filling tasks as well (see Figure 8).

Solutions: This job does involve high hand force at several task activities as well as high hand repetitions, therefore this job may fall into the caution zone if

Figure 7. High hand force pinching

Figure 8. Order selecting

the total duration of the high hand force is more than 2 hours. Recognizing that the potential risk involved in this job, the company adopted a job rotation practice so that the worker does not work on the packaging task for extended hours, but also does order filling tasks, where the use of high hand force is much infrequent. With the job rotations, it is unlikely that the total duration that the worker is exposed to high hand force and repetitive hand movements is more than 3 hours during a workday. Therefore this job is not a hazard zone job.

However, if different practices are used in other similar companies where the

worker is assigned to perform only the packaging task during a workday, the total duration of high hand force and repetition would exceed the 3 hour limit and puts the job into the hazard zone. In this circumstance, redesign of the job is needed to reduce the high hand force required at the job. Possible solutions include 1) installing a roller system so that the boxes can be transported without lifting (this eliminates the use of high hand force to grip the flaps of the boxes to lift), and 2) a funnel with regulators to substitute the use of the scoop used in the filling of small boxes (this reduces the high hand force involved in the filling activities).

Heavy lifting activities are also involved in the packaging task when the worker brings larger boxes to the packaging station (see picture above). Most boxes usually weigh about 25 to 30 lb (possible maximal box weight is about 64 lb). Due to the nature of job rotations, a worker will only lift 17 to 18 boxes during a workday. This will put the job into the caution zone. However, because most of the time the worker does not have to assume awkward postures during the lifting and the lifting frequency is not high, the job is not considered a hazard zone job.

However, if in some companies a worker is only assigned to do this packaging task (figure 9), lifting frequency could be increased dramatically and the job could be in the hazard zone. If this is the case, a roller system together with a height adjustable platform might be considered to reduce or eliminate the manual lifting.

Figure 9. Prolonged manual handling of heavy parts could be reduced using a roller conveyer system.

Reducing hazard of poor work postures

Risk factors: Awkward postures can sometimes be seen when workers are performing different tasks at this company. For example, the packaging worker sometimes squats to pick up empty boxes, the worker performing order filling tasks may reach his arms above the shoulders, and the customer service representative may assume a posture with the neck bent to more than 30º (see Figures 10-12). And in the of-

Figure 10. Squatting

Figure 11. Reaching

Figure 12. Neck bending

fices, workers may assume different awkward postures now and then during a workday (see Figure 13).

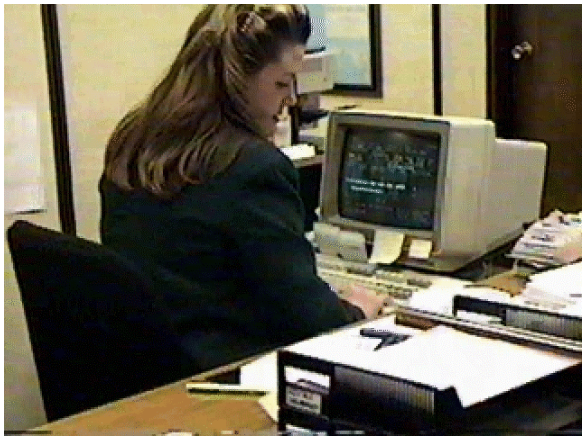

Figure 13. Neck bending

Evaluations: While noting that the awkward postures exist at the jobs, the determination of the risk level will depend on how awkward the postures are and how long the worker is exposed to such awkward postures. For the neck and trunk postures, another important aspect to consider is whether the worker has the ability to vary postures at the job. Observing the jobs at Empire Bolt and Screw, most of the awkward postures do not last for extended period of time. Each individual worker is unlikely to assume the awkward posture for more than 2 hours during a workday. It is also the case that most workers have the ability to vary their postures during the workday. Therefore the awkward postures at these jobs do not fall into the caution zone.

Recognized that the Washington State Ergonomics Rule applies the minimal requirements on the jobs, improvements on the workstation designs may not be required according to the rule, but could still improve the work postures and comfort of the workers. For example, raising the computer monitor and providing a document holder might improve the neck postures for the operator using a computer. Chair height needs to be considered to allow not only comfortable upper arm postures, but also to provide enough room for the knees. And sufficient space is needed on the desk to provide support for the arms when using a computer keyboard.

This report is based on the observations at Empire Bolt and Screw and communications with the management and employees during the year 2000. Changes on jobs, workstations, and products could change physical exposure.